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Parasite Stress and Pathogen Avoidance Relate to Distinct Dimensions of Political Ideology Across 30 Nations

Joshua M. Tybur[a,1], Yoel Inbar[b], Lene Aarøe[c], Pat Barclay[d], Fiona Kate Barlow[e], Mícheál de Barra[f,g], D. Vaughn Becker[h], Leah Borovoi[i], Incheol Choi[j], Jong An Choi[k], Nathan S. Consedine[l], Alan Conway[m], Jane Rebecca Conway[n], Paul Conway[o,p], Vera Cubela Adoric[q], Ekin Demirci[r], Ana María Fernández[s], Diogo Conque Seco Ferreira[t], Keiko Ishii[u], Ivana Jakšić[v], Tingting Ji[a], Florian van Leeuwen[c], David M. G. Lewis[w], Norman P. Li[x], Jason C. McIntyre[y], Sumitava Mukherjee[z], Justin H. Park[aa], Boguslaw Pawlowski[bb], Michael Bang Petersen[c], David Pizarro[cc], Gerasimos Prodromitis[dd], Pavol Prokop[ee,ff], Markus J. Rantala[gg], Lisa M. Reynolds[l], Bonifacio Sandin[hh], Baris Sevi[r], Delphine de Smet[ii], Narayanan Srinivasan[jj], Shruti Tewari[jj], Cameron Wilson[d], Jose C. Yong[w], Iris Žeželj[kk]

a. Department of Experimental and Applied Psychology, VU Amsterdam, Amsterdam 1081BT, The Netherlands.
b. Department of Psychology, University of Toronto, Toronto, Ontario, M1C 1A4, Canada.
c. Department of Political Science, Aarhus University, Aarhus 8000 C , Denmark.
d. Department of Psychology, University of Guelph, Guelph, Ontario, N1G 2W1, Canada.
e. School of Psychology, The University of Queensland, QLD, 4072, Australia.
f. Institute of Applied Health Sciences, College of Life Sciences and Medicine, University of Aberdeen, Aberdeen AB25 2ZD, United Kingdom.
g. Center for the Study of Cultural Evolution, Stockholm University, 114 18 Stockholm, Sweden.
h. Human Systems Engineering, Arizona State University, Mesa, AZ 85212.

i. Department of Psychology and Education, The Open University, Raanana 4353701, Israel.

j. Department of Psychology, Seoul National University, Seoul 08826, South Korea.

k. Center for Happiness Studies, Seoul National University, Seoul 08826, South Korea.

l. Faculty of Medical and Health Sciences, The University of Auckland, Auckland 92019 , New Zealand.

m. School of Politics and International Relations, University College Dublin, Dublin 4, Ireland.

n. Institute of Psychiatry, Psychology & Neuroscience, King's College London, London SE5 8AF, United Kingdom.

o. Department of Psychology, Florida State University, Tallahassee, Florida, 32304.

p. Department of Psychology, University of Cologne, Cologne, Germany, 50931.

q. Department of Psychology, University of Zadar, 23000 Zadar, Croatia.

r. Department of Psychology, Bilkent University, 06800 Bilkent, Ankara, Turkey.

s. Escuela de Psicología, Universidad de Santiago de Chile, 9170197 Santiago, Chile.

t. Department of Psychology, Universidade Federal de Sergipe, 49100-000 Sergipe, Brazil.

u. Department of Psychology, Kobe University, Kobe 657-8501, Japan.

v. Institute for Educational Research, Belgrade University, 11000, Belgrade, Serbia.

w. School of Psychology and Exercise Science, Murdoch University, WA 6150, Australia

x. School of Social Sciences, Singapore Management University, Singapore 178903.

y. Institute of Psychology, Health and Society, University of Liverpool, Liverpool L69 3GL, United Kingdom.

z. Indian Institute of Management, Ahmedabad, Gujarat 380015, India.

aa. School of Experimental Psychology, University of Bristol, Bristol BS8 1TU, United Kingdom.

bb. Department of Human Biology, University of Wroclaw, Wroclaw 50-138, Poland

cc. Department of Psychology, Cornell University, Ithaca, NY, 14853.

dd. Department of Psychology, Panteion University of Social and Political Sciences, 176 71, Athens, Greece.

ee. Department of Biology, Trnava University, 918 43 Trnava, Slovakia

ff. Institute of Zoology, Slovak Academy of Sciences, 845 06 Bratislava, Slovakia

gg. Department of Biology & Turku Brain and Mind Center University of Turku, 20014 Turku, Finland.

hh. Facultad de Psicología, Universidad Nacional de Educación a Distancia, 28040 Madrid, Spain.

ii. Department of Interdisciplinary Study of Law, Private Law, and Business Law, Ghent University, B-9000 Ghent, Belgium.

jj. Centre of Behavioural & Cognitive Sciences, University of Allahabad, Allahabad, Allahabad 211002, Uttar Pradesh, India.

kk. Faculty of Philosophy, Belgrade University, 11000 Belgrade, Serbia.

1. To whom correspondence should be addressed. Email: j.m.tybur@vu.nl

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Abstract

People who are more avoidant of pathogens are more politically conservative, as are nations with greater parasite stress. In the current research, we test two prominent hypotheses that have been proposed as explanations for the relationship between pathogens and politics. The first, which is an intragroup, *traditional norms* account, holds that these relationships are based on motivations to adhere to local norms, which are sometimes shaped by cultural evolution to have pathogen neutralizing properties. The second, which is an intergroup, *outgroup-avoidance* account, holds that relationships between pathogen avoidance and ideology are based on motivations to avoid contact with outgroups (who might pose greater infectious disease threats than ingroup members). Results from a study surveying 11,501 participants across 30 nations are more consistent with the traditional norms account than with the outgroup-avoidance account. National parasite stress relates to traditionalism (an aspect of conservatism especially related to adherence to group norms) but not to social dominance orientation (an aspect of conservatism especially related to endorsements of intergroup barriers and negativity toward ethnic and racial outgroups). Further, individual differences in pathogen-avoidance motives (i.e., disgust sensitivity) relate more strongly to traditionalism than to social dominance orientation within the 30 nations.

Significance Statement

Pathogens—and anti-pathogen behavioral strategies—affect myriad aspects of human behavior. Recent findings suggest that anti-pathogen strategies relate to political attitudes, with more ideologically conservative individuals reporting more disgust toward pathogen cues, and with higher parasite stress nations being, on average, more conservative. However, no research has yet adjudicated between two theoretical accounts proposed to explain relationships between pathogens and politics. We find that national parasite stress and individual disgust sensitivity relate more strongly to adherence to traditional norms than they relate to support for barriers between social groups. These results suggest that pathogens relate to political attitudes more via motivations to support traditional norms than via motivations to erect and maintain barriers against outgroups.

The costs imposed by pathogens on their hosts have spurred the evolution of complex anti-pathogen defenses, many of which are behavioral (1, 2). In humans, such defenses range from the proximate avoidance of pathogen cues to the execution of complex rituals, often with far-reaching consequences (3). At the individual level, functionally specialized psychological mechanisms detect pathogen cues and motivate avoidance of physical contact with pathogens (e.g., via the emotion of disgust; 4). These mechanisms—which have been collectively referred to as the *behavioral immune system*—influence, among other things, mate preferences (5, 6), dietary preferences (7), and person perception (8) (see 9, for a summary). At the cultural level, many rules and rituals might function to mitigate infection risk, including norms concerning food preparation and consumption (e.g., 10, 11), coughing and sneezing, and the use of a particular hand in ablutions (and little else).

Some of the most provocative findings in the behavioral immune system literature suggest that both the presence of pathogens within an ecology and individual motivations to avoid pathogens influence our political attitudes. Nations with greater infectious disease burdens (i.e., parasite stress) are governed by more authoritarian regimes and are more religious, more collectivistic, and less open to experience (13-17)—all hallmarks of conservative ideology. At the individual level, the degree to which people are disgusted by pathogen cues and wary of infection-risky situations relates to a number of politically relevant variables, including political party preference, openness to experience, and collectivism (see 12, for a summary). Two distinct hypotheses—one of which is fundamentally an intragroup account, and one of which is fundamentally an intergroup account—have been forwarded to explain these empirical patterns (13, 18, 19). The first, which we refer to as a *traditional norms* account, is based on the assumption that some local rules and rituals (e.g., how foods are prepared and stored, which

meats are acceptable, which hand one eats with) evolve culturally to neutralize local pathogen threats. This intragroup account suggests that departures from traditional norms puts individuals at a greater risk of infection, so more pathogen-avoidant individuals favor ideological positions that encourage adherence to traditional values (11, 20, 21).

The second hypothesis, which we refer to as an *outgroup avoidance* account, is based on the assumption that individuals develop greater resistance to locally-prevalent pathogens than to pathogens endemic to foreign ecologies—even, perhaps, those ecologies close enough to reach by foot (14, 16). This intergroup account holds that contact with outgroup members (who carry pathogens that individuals putatively have less immunity against) is more likely to result in infection than is contact with ingroup members. Consequently, more pathogen-avoidant individuals favor ideological positions that minimize intergroup pathogen transmission.

Which of these two hypotheses better explains the relationship between the behavioral immune system and ideology? Given that conservatism is characterized both by stronger preferences for ethnic, racial, and national ingroups (vs. outgroups) and by greater adherence to traditional cultural norms (22), existing data have been interpreted as supporting both hypotheses. Of course, both accounts could be correct—both intergroup and intragroup motivations could underlie the observed relationships between pathogens and politics. That said, no work has yet aimed to generate and test competing predictions derived from these two hypotheses. We aim to fill this gap here. To do so, we depart from standard practice in this area, which has interpreted several different constructs as reflecting a single dimension of ideology. For example, a recent meta-analysis of the relationship between the behavioral immune system and conservatism treated diverse constructs—including right-wing authoritarianism, collectivism, religiosity, and social dominance orientation—as interchangeable manifestations of

social conservatism (12). In the current investigation, we consider how the above-described intragroup and intergroup accounts can be used to make distinct predictions regarding the relationship between the behavioral immune system and two dimensions of ideology: traditionalism and social dominance orientation.

Dimension-specific relationships between pathogens and ideology

Political psychologists suggest that ideology can be broadly categorized along two dimensions (22, 23), one of which is conceptualized as relating to intragroup attitudes and the other of which is conceptualized as relating to intergroup attitudes (24). The first (intragroup) dimension is characterized by favoring adherence to versus departures from social traditions (frequently operationalized as right wing authoritarianism and, specifically, the traditionalism facet of right wing authoritarianism; 25). The second (intergroup) dimension is characterized by favoring versus rejecting (hierarchical) boundaries between groups (frequently operationalized as social dominance orientation; 26).

Although traditionalism and social dominance orientation (SDO) are generally positively correlated, they relate differently to social values (27-29). Whereas traditionalism relates strongly to religiosity (25)—a key variable in the behavioral immune system and ideology literature—SDO relates only weakly to conformity and adherence to religious orthodoxy (30, 31). Moreover, although both traditionalism and SDO relate to prejudices, they relate to prejudices toward different targets. Relative to SDO, traditionalism especially relates to prejudice toward the types of individuals who violate traditional social norms, including prostitutes, atheists, homosexuals, and drug users (32). In contrast, SDO especially relates to prejudice toward individuals possessing cues to different ecological origin (e.g., skin color), including White Americans' prejudice toward Blacks (33) and New Zealanders' prejudice

toward Africans, Asians, and Maori (31, 32). Reactions to immigrants—outgroup members hailing from foreign ecologies—can further highlight differences between SDO and traditionalism. Traditionalism relates to anti-immigrant sentiments when immigrants are pictured as failing to adopt local cultures rules and rituals; in contrast, SDO relates to anti-immigrant sentiment when immigrants are pictured as assimilating and, hence, increasing contact between groups (34).

Given the above considerations, the intragroup, traditional norms hypothesis implies that pathogen-avoidance motives should relate to traditionalism, but not necessarily SDO. The intergroup, outgroup-avoidance hypothesis implies a different prediction. Because SDO relates more strongly to prejudice toward individuals from foreign ecologies (e.g., immigrants, individuals from a different ethnic background), whereas traditionalism relates more strongly to prejudice toward non-traditional subgroups within a common ecology (e.g., homosexuals, atheists) (31, 32, 34), the outgroup-avoidance hypothesis implies that pathogen-avoidance motives should relate to SDO, but not necessarily to traditionalism.

Testing competing behavioral immune system hypotheses within and across nations

Although results at individual and societal levels have been interpreted as providing converging evidence for behavioral immune system hypotheses of ideology, they differ in two important ways, each of which has implications for the hypotheses described above. First, almost all studies reporting individual-level relationships between the behavioral immune system and ideology have been conducted using North American samples. For example, 23 of the 24 studies considered in a recent meta-analysis of the relationship between individual differences in pathogen-avoidance motives and social conservatism used American or Canadian samples (12). In contrast, studies at the societal level have necessarily tested group-level relationships between

parasite stress and ideology across nations or states. Second, whereas individual-level studies have used self-report instruments to assess pathogen-avoidance motives, cross-cultural studies have used national parasite stress estimates, with the assumption that greater ecological parasite stress leads to stronger individual-level motivations to avoid pathogens (35, 36). For example, in describing the potential relationship between variables measured at the individual level (e.g., disgust sensitivity) and societal level (i.e., parasite stress), Fincher and Thornhill (14) argue, "Our approach suggests that the relationship between infectious disease and religiosity will be mediated…by disgust and contamination sensitivity" (page 78).

No research has yet tested (1) whether the individual-level relationships between pathogen-avoidance motives and dimensions of ideology (including traditionalism and SDO) found in North America samples replicate across cultures; (2) whether individuals in higher parasite stress nations indeed score higher on instruments designed to measure pathogen-avoidance motives (e.g., disgust sensitivity); and (3) whether individual-level pathogen-avoidance motives mediate any relationship between country-level parasite stress and traditionalism, SDO, or both. The current research aims to address these lacunas by measuring traditionalism, SDO, and (pathogen) disgust sensitivity across a number of nations, which vary in parasite stress. In doing this, we test competing predictions made by the two behavioral immune system hypotheses of ideology described above, and we do so at both the national level and the individual level. We then use the same data set to test the common assumption that higher parasite stress at the country level is associated with stronger pathogen avoidance-motives at the individual level. In total, we report results using a sample of 11,501 individuals from 30 nations (see Table 1 for details).

Results

Traditionalism

The traditional norms hypothesis predicts a relationship between traditionalism and pathogen-avoidance motives. Results at both the individual and national levels were consistent with this account. Individuals in nations with greater parasite stress were more traditional, $t(26.54) = 4.16$, $p < .001$ (see Figure 1); to illustrate, nations' average traditionalism scores correlated strongly with parasite stress, $r = .70$, $p < .001$. Notably, these results are similar to those reported in previous analyses of the relationship between parasite stress and archival estimates of collectivism across 52 and 70 nations, which yielded correlations of $r = .73$ and $r = .63$, respectively (13). *Within* nations, disgust sensitivity also related to traditionalism, $t(25.97) = 8.46$, $p < .001$, independent of national parasite stress. A random effects meta-analysis showed the correlation between disgust sensitivity and traditionalism to be $r = .10$, 95% CI [.07, .12]. Analyses on correlations disattenuated for unreliability yielded similar results, $r = .14$, 95% CI [.10, .18].

Social Dominance Orientation

The outgroup-avoidance account predicts a relationship between SDO and pathogen-avoidance motives. Results were not consistent with this prediction at the nation level, with individuals in higher parasite stress nations scoring no higher on SDO, $t(25.19) = 0.12$, $p = .91$ (see Figure 2), and with the correlation between national parasite stress and SDO close to zero (and in the opposite direction of predictions), $r = -.06$, $p = .75$. Within nations, disgust sensitivity was indeed related to SDO, $t(23.57) = 6.52$, $p < .001$. However, the random effects meta-analysis indicated that the correlation between disgust sensitivity and SDO was close to zero, $r = .04$, 95% CI [.02, .06]. Analyses on disattenuated correlations yielded similar results, $r = .06$, 95% CI

[.03, .10]. Notably, these 95% confidence intervals did not overlap with those for the relationship between disgust sensitivity and traditionalism.

Cross-National Variability in Disgust Sensitivity

Although we observed variation in disgust sensitivity across nations, $\tau 00 = .09$, $\chi^2(1) = 47.41$, $p < .001$, this variability was unrelated to parasite stress, $t(26.18) = 1.12$, $p = .28$ (see Figure 3). That said, results suggested that the disgust sensitivity instrument had similar validity across samples. In addition to observing a relationship between disgust sensitivity and traditionalism across nations, we also replicated previously reported sex differences in disgust sensitivity (37, 38), with women consistently scoring higher than men across nations, $t(20.73) = 16.46$, $p < .001$, meta-analyzed $d = .41$, 95% CI [.36, .45].

Discussion

Several lines of evidence point to a relationship between pathogens and politics (9, 12). Here, we aimed to clarify the nature of this relationship by generating competing predictions using two behavioral immune system hypotheses of conservatism. The traditional norms account predicts that pathogen-avoidance motives should relate to traditionalism, which, relative to SDO, more strongly relates to intragroup attitudes, such as endorsements of traditional norms and antipathy toward within-group deviants. In contrast, the outgroup-avoidance account predicts that pathogen-avoidance motives should relate to SDO, which, relative to traditionalism, more strongly relates to intergroup attitudes, such as support for intergroup barriers and negative attitudes toward ethnic outgroups. Results supported the traditional norms account over the outgroup-avoidance account, with national parasite stress relating strongly to traditionalism but not to SDO. Furthermore, a meta-analysis of individual-level relationships within the 30 sampled nations revealed that disgust sensitivity relates more strongly to traditionalism than to SDO.

Indeed, whereas the traditionalism-disgust sensitivity relationship was of a magnitude similar to that observed in a large recent study in the U.S. (39), the SDO-disgust sensitivity relationship, while statistically significant, was near zero.

Results also helped to clarify the relationship between national parasite stress and individual pathogen-avoidance motives. We found no support for the notion that individuals living in more pathogen-dense countries are more disgust sensitive. This null result may be understood by considering both the benefits and the costs of investing in pathogen avoidance. Although greater disgust sensitivity steers individuals away from cues to pathogens, it also constrains dietary, sexual, and social contact opportunities (4, 40). If pathogens are ubiquitous enough that investments in avoidance do not decrease infection—at least not enough to offset the benefits of behaviors that pose some infection risk—then individuals in pathogen-rich ecologies could invest more effort in resisting pathogens (e.g., through greater production of pathogen-combating cytokines; see 41) rather than avoiding them. Of course, our parasite stress data—like most used in this literature (e.g., 14)—was measured at the country level, and we cannot rule out the possibility that individual disgust sensitivity is calibrated by individual rather than national pathogen exposure. However, findings here corroborate previous results indicating that childhood illness in a pathogen-rich location (Bangladesh) is unrelated to disgust sensitivity in adulthood (42).

The observed null relationship between disgust sensitivity and national parasite stress suggests that different processes might account for the relationships between ideology and national parasite stress versus ideology and disgust sensitivity. At the national level, those norms categorized as “traditional” might be more successfully transmitted and sustained within pathogen rich ecologies if such norms lead to reduced contact with pathogens (9-11, 20). Indeed,

mathematical models indicate that pathogens can result in the cultural evolution of such protective behaviors (43). Alternatively, traditionalism might promote within-coalition alliances that can provide health care in times of illness, which might be especially critical to survival in high parasite stress ecologies (14, 19, 44, 45). Or traditional norms might endure more in pathogen-rich nations simply because the ecologies of such nations are less hospitable to liberal Western institutions and infrastructures, and were thus less influenced by European colonialism (46).

At the individual level, those who are more motivated to avoid pathogens might find traditional rules and rituals more appealing for a number of reasons. Relative to less restricted sex (i.e., more experimental, more partners), traditional, monogamous sex exposes individuals to fewer pathogens (39) and reduces the ability for sexually transmitted infections to thrive within communities (47). Traditional food preparation techniques often include ingredients with antimicrobial properties (10), traditional food taboos can evolve culturally to limit pathogen and toxin exposure (7, 48), and traditional hygiene rules can coordinate behaviors to limit pathogen transmission (e.g., when one hand is used to contact bodily waste and is not used for physical contact with foods or with social allies). Further, within each of these accounts, relationships between pathogen avoidance and traditionalism could solely reflect motivations to avoid direct contact with pathogens, or they could also reflect motivations to regulate others' behavior, which might expose others to pathogens (18, 47). Just as we have attempted to clarify why the behavioral immune system might relate to political ideology—either based on outgroup avoidance or norm adherence—future work can clarify which of these aspects of traditionalism might be especially appealing to those individuals especially motivated to avoid pathogens.

Method

Participants

We recruited participants in 30 countries (see Table 1). We aimed to enroll at least 200 participants in each country and to recruit participants from both universities and the general-population. After excluding participants who (a) reported being less than 18 years old, (b) did not report their sex, or (c) had completely missing data for any of the instruments described below, our final sample consisted of 11,501 participants, who were 42% male and had a mean age of 30.06 years (SD = 12.62).

Measures

Participants completed a short questionnaire described as concerning "attitudes toward political issues and groups of people." In all but one country (Sweden, where English fluency is high), questionnaires were translated into the official or native language, with multiple languages offered in some multilingual countries (see Table 1 for language details). The questionnaire contained measures of traditionalism, SDO, and disgust sensitivity. It also included items peripherally related to this paper, including sex, age, religious attendance, endorsement of policy issues (e.g., Should society increase its use of nuclear power?), and attitudes toward different groups of people. We focus only on traditionalism, SDO, and disgust sensitivity here, but the English version of the survey (including all items) is available in the online Supplemental Materials.

Traditionalism.

We assessed traditionalism using the six-item short form of the traditionalism facet of the Authoritarianism-Conservatism-Traditionalism scale (25). This instrument relates strongly to religiosity and other manifestations of traditional values. Example items include "The 'old

fashioned ways' and 'old fashioned values' still show the best way to live" and "This country will flourish if young people stop experimenting with drugs, alcohol, and sex, and pay more attention to family values." Responses were recorded on a 0 (Strongly Disagree) to 6 (Strongly Agree) scale.

Social dominance orientation.

The four-item Short Social Dominance Orientation scale (49) was used to assess social dominance orientation. The instrument has been used in at least one previous cross-cultural study, where it consistently (negatively) related to desires to protect ethnic and religious minorities across cultures (49). Example items include "In setting priorities, we must consider all groups" (reverse coded) and "We should *not* push for group equality." Responses were recorded on a 0 (Extremely Oppose) to 6 (Extremely Favor) scale.

Disgust sensitivity.

Most research in the behavioral immune system literature has operationalized pathogen-avoidance motives using self-report measures of disgust sensitivity or contamination sensitivity (36). We used the seven-item pathogen factor of the Three Domain Disgust Scale (50) for the current investigation, for two reasons: (1) its item content appears more interpretable to individuals from diverse cultures relative to other instruments, and (2) it is less confounded with sexual openness and neuroticism than other disgust sensitivity instruments (39, 51). Participants reported how disgusting they find each of six items on a 0 (not at all disgusting) to 6 (extremely disgusting) scale. Example items include "Stepping on dog poop" and "Sitting next to someone who has red sores on their arm."

Parasite stress

Researchers have used several different indices to estimate parasite stress (36), with the most frequently used being the historical prevalence of pathogens within regions (52) and the contemporary frequency of nonzoonotic parasites within regions (14). These two estimates were strongly correlated for the 30 nations sampled here, $r = .75$. We opted to use the historical prevalence estimates because they were less strongly skewed, with nation-level results less strongly influenced by the higher parasite stress nations sampled here (e.g., India, Brazil). No conclusions changed when using the nonzoonotic disease estimates, nor when we used alternative parasite stress estimates (zoonotic parasites and contemporary infectious disease deaths; see Supplementary Materials for details and results). To facilitate visual interpretation of results (Figures 1-3), we added a constant to each nation's parasite stress score so that the lowest scoring country (Canada) had a value of zero.

Analytical strategy

Data were analyzed in SPSS version 23 using random slope, random intercept linear mixed modeling with Restricted Maximum Likelihood Estimation (REML) criteria. Participants (level-1 units) were nested within nations (level-2 units). Given that our samples varied in their sex ratio and mean age, we controlled for participant sex and age. We used disgust sensitivity as a level-1 predictor to test for effects of individual pathogen-avoidance motivations on SDO and traditionalism. We used parasite stress as a level-2 variable to test for effects of parasite stress on SDO, traditionalism, and pathogen-avoidance motivations. We allowed the effects of each level-1 variable to vary across level-2. Our analyses can thus be described as follows, where Y_{ij} refers to traditionalism or SDO for individuals (i) within nations (j):

Level 1: $Y_{ij} = \beta_{0j} + \beta_{1j}\text{DISGUST}_{ij} + \beta_{2j}\text{SEX}_{ij} + \beta_{3j}\text{AGE}_{ij} + e_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}\text{PARASITE}_j + u_{0j}$; $\beta_{1j} = \gamma_{10} + u_{1j}$; $\beta_{2j} = \gamma_{20} + u_{2j}$; $\beta_{3j} = \gamma_{30} + u_{3j}$

We also tested whether disgust sensitivity (Y_{ij} below) varied across nations as a function of parasite stress, with the following model.

Level 1: $Y_{ij} = \beta_{0j} + \beta_{1j}\text{SEX}_{ij} + \beta_{2j}\text{AGE}_{ij} + e_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}\text{PARASITE}_j + u_{0j}$; $\beta_{1j} = \gamma_{10} + u_{1j}$; $\beta_{2j} = \gamma_{20} + u_{2j}$

After multi-level analyses, we meta-analyzed the level-1 effects using Comprehensive Meta-Analysis software. This strategy allows for a point estimate of the effect size of the relationship between disgust sensitivity and the two dimensions of ideology, as well as 95% confidence intervals for those relationships. Each country was treated as a different sample. For both traditionalism and SDO, we conducted two meta-analyses of the relationship with disgust sensitivity. The first involved meta-analyzing the observed effect size within each country; the second involved meta-analyzing the effect size after disattenuating for the country-specific unreliability in disgust sensitivity, traditionalism, and SDO.

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Table 1. Survey language(s), proportion male, mean age, and bivariate correlations for samples in each nation surveyed. T = traditionalism, DS = disgust sensitivity, and SDO = social dominance orientation. *r*' statistics are disattenuated for unreliability. The bottom row includes meta-analyzed correlations and 95% confidence intervals.

Table 1. Survey language(s), proportion male, mean age, and bivariate correlations for samples in each nation surveyed. T = traditionalism, DS = disgust sensitivity, and SDO = social dominance orientation. r' statistics are disattenuated for unreliability. The bottom row includes meta-analyzed correlations and 95% confidence intervals.

Country	Language(s)	N	% Male	Age	r_{T_DS}	r'_{T_DS}	r_{SDO_DS}	r'_{SDO_DS}
Argentina (AR)	Spanish	827	64	34	.13	.20	.08	.11
Australia (AU)	English	300	48	31	.05	.07	.05	.06
Belgium (BE)	Dutch	448	46	23	.07	.10	.04	.06
Bosnia & Herzegovina (BA)	Bosnian and Croatian	326	30	28	.12	.15	.05	.07
Brazil (BR)	Portuguese	288	46	23	.03	.04	-.01	-.01
Canada (CA)	English	307	42	35	.03	.04	-.16	-.22
Chile (CL)	Spanish	262	49	28	.03	.04	-.01	-.01
China (CN)	Simplified Chinese	377	10	21	.12	.22	.12	.20
Croatia (HR)	Croatian	554	23	30	.08	.11	-.03	-.04
Denmark (DK)	Danish	126	40	24	.05	.08	-.02	-.02
Finland (FI)	Finnish	190	42	41	.33	.45	.05	.08
France (FR)	French	266	29	23	.09	.12	.15	.21
Germany (DE)	German	374	47	32	.12	.17	.05	.08
Greece (GR)	Greek	317	27	32	.10	.15	.08	.11
India (IN)	Hindi and English	504	57	23	.02	.03	.08	.14
Ireland (IE)	English	150	52	32	.09	.12	.17	.23
Israel (IL)	Hebrew	339	38	34	.22	.27	.03	.04
Japan (JP)	Japanese	394	53	32	.11	.17	-.04	-.06
Netherlands (NL)	Dutch	574	42	35	.15	.22	.02	.02
New Zealand (NZ)	English	595	27	29	.11	.15	-.06	-.09
Poland (PL)	Polish	210	31	28	-.09	-.12	-.05	-.09
Serbia (RS)	Serbian	402	31	29	.11	.14	.06	.08
Singapore (SG)	English	239	48	25	.06	.08	.03	.04
Slovakia (SK)	Slovak	338	33	32	.12	.16	.02	.03
Republic of Korea (KR)	Korean	137	42	21	-.05	-.07	.08	.12
Spain (ES)	Spanish	699	33	33	-.01	-.02	.00	.00
Sweden (SE)	English	117	45	30	.37	.52	.30	.41
Turkey (TR)	Turkish	1082	50	34	.12	.15	.03	.06
United Kingdom (UK)	English	276	27	28	.18	.25	-.05	-.07
United States (US)	English	483	62	30	.11	.13	.07	.09
Total		11,501	42	30	.10 [.07-.12]	.14 [.10-.18]	.04 [.02-.06]	.06 [.03-.10]

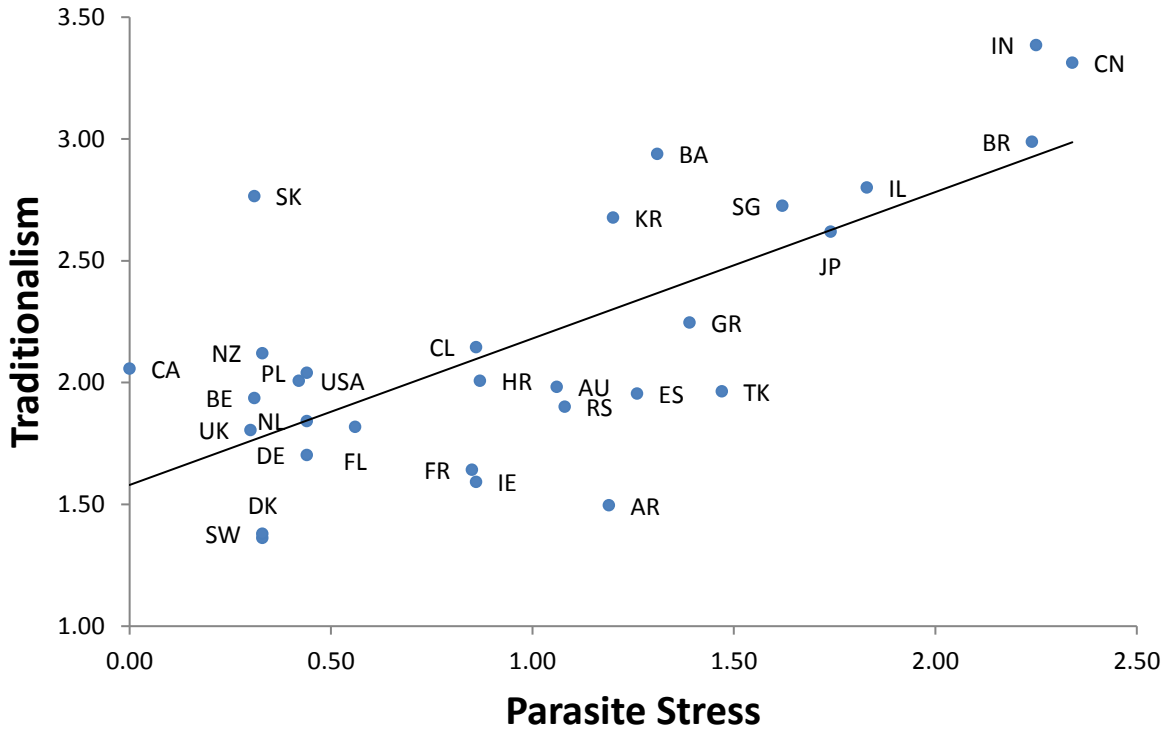
Figure legends

Fig. 1. The scatterplot displays the relationship between national parasite stress and traditionalism (r = .70). Each data point represents the mean traditionalism for a nation (with data points labeled with two letter country codes), controlling for sample demographic characteristics (age and sex).

Fig. 2. The scatterplot displays the relationship between national parasite stress and social dominance orientation (r = -.06). Each data point represents the mean traditionalism for a nation (with data points labeled with two letter country codes), controlling for sample demographic characteristics (age and sex).

Fig 3. The scatterplot displays the relationship between national parasite stress and disgust sensitivity (r = .18). Each data point represents the mean traditionalism for a nation (with data points labeled with two letter country codes), controlling for sample demographic characteristics (age and sex).

Figure 1


Traditionalism
Parasite Stress
3.50
3.00
2.50
2.00
1.50
1.00
0.00
0.50
1.00
1.50
2.00
2.50
IN
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BR
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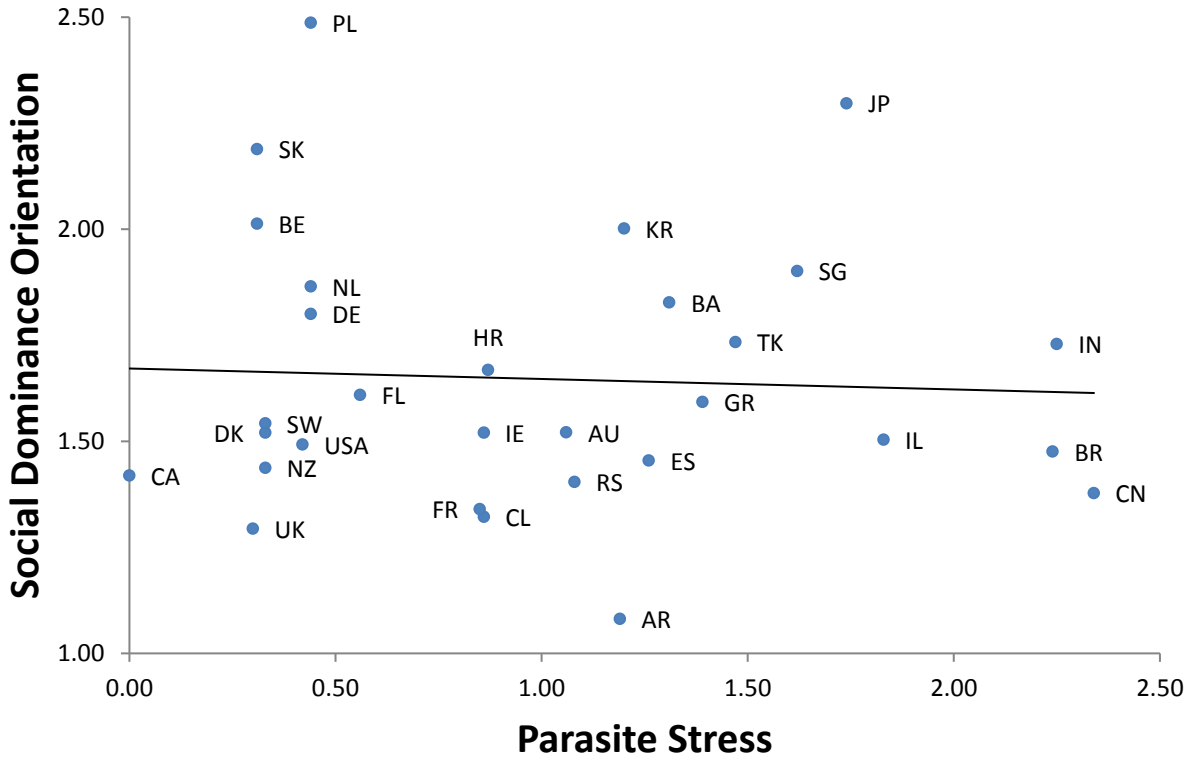
Figure 2


Social Dominance Orientation
Parasite Stress
2.50
2.00
1.50
1.00
0.00
0.50
1.00
1.50
2.00
2.50
PL
JP
SK
BE
KR
SG
NL
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HR
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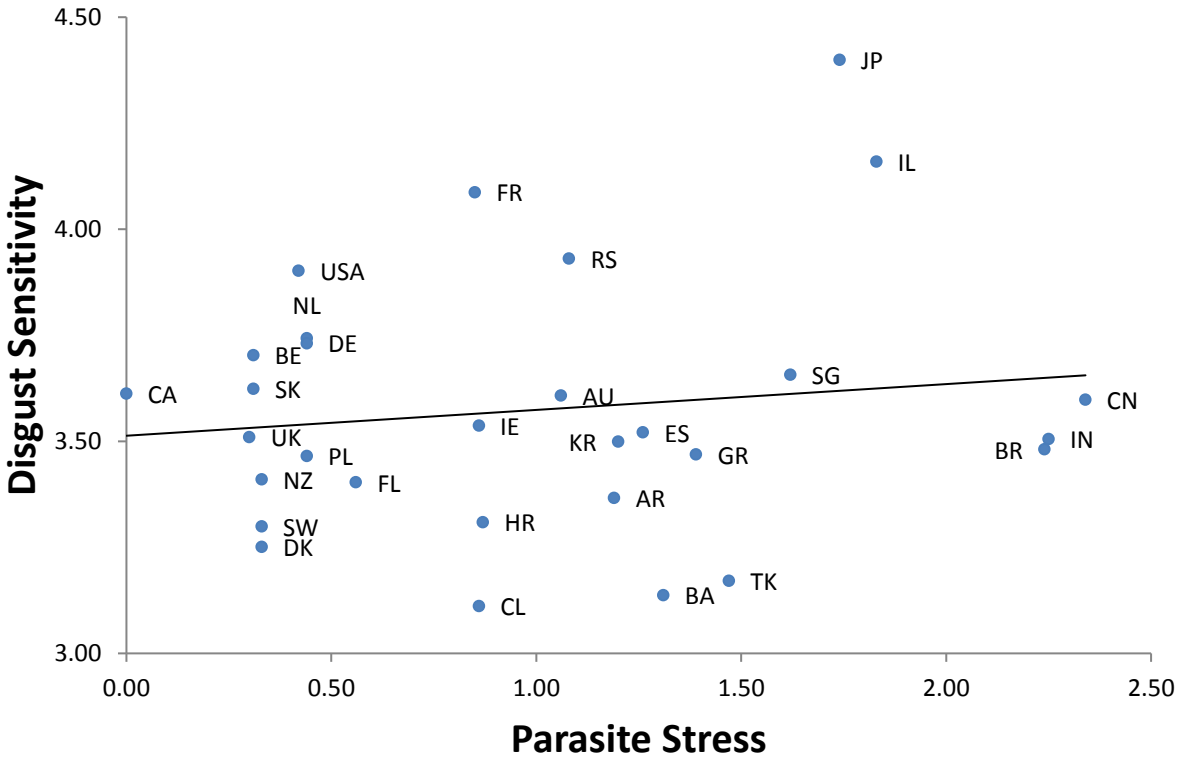
Figure 3


4.50
4.00
3.50
3.00
Disgust Sensitivity
0.00
0.50
1.00
1.50
2.00
2.50
Parasite Stress
JP
IL
FR
RS
USA
NL
DE
BE
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CA
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AU
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Supplementary Information

The main text reports analyses using estimates of national historical parasite prevalence to operationalize parasite stress. The supplementary analyses reported here describe results when alternative variables are used to operationalize parasite stress. We report results using historical parasite prevalence (i.e., analyses used in the main text, see 1) and two alternative estimates. The first alternative uses nonzoonotic infectious disease estimates (2), and the second alternative uses the first component extracted from a principal component analysis on historical parasite stress, nonzoonotic infections disease, zoonotic infectious disease estimates, and 2012 World Health Organization infectious disease deaths per country. This principal component was log transformed to correct for positive skew. Correlations between the historical prevalence estimate reported in the main text and the nonzoonotic disease estimate and the principal component were $r = .54$ and $r = .85$, respectively, and the correlation between the nonzoonotic disease estimate and the principal component was $r = .86$. All nation-level results reported below control for level-1 effects of participant sex, participant age, and disgust sensitivity.

Traditionalism

The effect of national parasite stress on traditionalism was similar across operationalizations of parasite stress: historical pathogen prevalence, $t(26.54) = 4.16$, $p < .001$, nonzoonotic infectious disease estimate, $t(27.32) = 3.23$, $p < .01$, and the principal component from multiple estimates, $t(27.13) = 3.36$, $p < .01$. Correlations between national traditionalism averages and the three parasite stress indices were $r = .70$, $r = .51$, and $r = .62$, respectively.

Social Dominance Orientation

The effect of national parasite stress on SDO was similar across operationalizations of parasite stress: historical pathogen prevalence, $t(25.19) = 0.11$, $p = .91$, nonzoonotic infectious

disease estimate, $t(24.86) = 0.91$, $p = .37$, and the principal component from multiple estimates, $t(24.97) = 0.57$, $p = .57$. Correlations between national SDO averages and the three parasite stress indices were $r = -.06$, $r = -.17$, and $r = -.17$, respectively.

Cross-National Variability in Disgust Sensitivity

The effect of national parasite stress on disgust sensitivity was similar across operationalizations of parasite stress: historical pathogen prevalence $t(26.18) = 1.12$, $p = .28$, nonzoonotic infectious disease estimate, $t(25.69) = 0.12$, $p = .91$, and the principal component from multiple estimates, $t(26.21) = 0.93$, $p = .36$. Correlations between national disgust sensitivity averages and the three parasite stress indices were $r = .18$, $r = .14$, and $r = .11$, respectively.

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2. Fincher CL, Thornhill R (2012) Parasite-stress promotes in-group assortative sociality: The cases of strong family ties and heightened religiosity. *Behav Brain Sci*, *35*: 1–59. doi.org/10.1017/S0140525X11000021